

MR050L Microbial Analysis of ISS Surfaces Using the Surface Sampler Packet Assembly

3.2 Medical Requirements Overview

TABLE 3.2: MEDICAL REQUIREMENTS OVERVIEW

MRID# and Title:	MR050L Microbial Analysis of ISS Surfaces Using the Surface Sampler Packet Assembly
Sponsor:	Medical Operations
Discipline:	Environmental Health System (EHS)
Category:	Medical Requirements (MR)
References:	SSP 50260 ISS Medical Operations Requirements Document (MORD)
Purpose/Objectives:	To evaluate the interior surfaces within the U.S. On-Orbit Segment (USOS) habitable environment of ISS for the presence of microbial contaminants based on results from preflight analysis, in-flight analysis, and postflight analysis of archive samples.
Measurement Parameters:	The detection of microorganisms on the surfaces of ISS
Deliverables:	<ul style="list-style-type: none">• Preflight assessment of the microorganisms recovered from spaceflight vehicle, module, and cargo.• In-flight assessment of microorganisms recovered from the surfaces within the USOS of ISS.• Postflight report assessing the microorganisms recovered from the surfaces within the USOS of ISS based on analysis of archive samples.
Flight Duration:	≥ 30 days
Number of Flights:	Every ISS Increment
Number and Type of Crew Members Required:	One to two crewmembers (CM) are trained in all EHS activities (US Specialist). One EHS CM will perform the in-flight activities.
Other Flight Characteristics:	N/A

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3.3 Preflight Training

TABLE 3.3: PREFLIGHT TRAINING

Preflight Training Activity Description:	Each USOS CM will be trained in all EHS activities (US Specialist).				
	Duration:		Schedule:	Flexibility:	Personnel Required:
	EHS Microbiology Operations		Pre-Assignment Training Flow	N/A	Crewmembers/ Instructor
	Schedule: Inexperienced crewmember: 60 minutes Experienced crewmember: Crew retention of skills tested in EHS Assessment, which is 90 minutes.		L-24/20		
Ground Support Requirements: Hardware/Software	Preflight Hardware:		Preflight Software:	Test Location:	
	Surface Sampler Kit (SSK)		N/A	U.S.	
Training Facilities:	Minimum Room Dimensions:	Number of Electrical Outlets:	Temperature Requirements:	Special Lighting:	
	8' x 10'	One (1)	Ambient	N/A	
	Hot or Cold Running Water:	Privacy Requirements:	Other:		
	N/A	N/A	1 Table & 6 chairs		
Constraints/Special Requirements:	None				
Launch Delay Requirements:	Refresher training will be conducted at crewmember request.				
Notes:	Crewmembers also have a chance to refresh skills during Routine Ops (Day-In-The-Life) simulations during the assigned flow. Experienced CM – CMs who have had previous training on EHS activities. Inexperienced CM – CMs who have not had previous training on EHS activities.				

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3.4 Preflight Activities

TABLE 3.4: PREFLIGHT ACTIVITIES

Preflight Activity	Description:	Pre-flight samples will be collected from all vehicles, modules, and cargo launching to the ISS. These samples will be analyzed to verify the microbiological sampling of interior surfaces of the habitable vehicle, element, or resupply cargo meet ISS applicable requirements and is safe for ISS environment and crew.				
		Activity:	Duration:	Schedule:	Flexibility:	Personnel Required:
	Schedule:	Preflight Surface Sampling	Vehicle Dependent	Vehicle Dependent	N/A	Vehicle Dependent
Ground Support Requirements: Hardware/Software	Preflight Hardware:		Preflight Software:		Test Location:	
	Surface Sampling Kit		N/A		Vehicle Dependent	
Testing Facilities:	Minimum Room Dimensions:	Number of Electrical Outlets:		Temperature Requirements:	Special Lighting:	
	N/A	N/A		Ambient	N/A	
	Hot or Cold Running Water:	Privacy Requirements:		Vibration/Acoustic Isolation:	Other:	
	Water for hand-washing	N/A		N/A	Refrigeration	
Constraints/Special Requirements:	<ul style="list-style-type: none">Detailed logistics (quantity) will be determined by personnel from the JSC Microbiology Laboratory in coordination with visiting vehicle representatives, hardware providers, and the Multilateral Medical Operations Panel (MMOP) Microbiology Subgroup.Payloads and associated hardware for ISS habitable flight elements, which have been assessed by the NASA/International Partner's Payloads Safety Review Panels and identified as a potential microbiological hazard, may be evaluated as specified by the Panels (e.g. surface sampling on a payload may be performed prior to vehicle loading).					
Launch Delay Requirements:	Remediation will need to be performed if the sample locations exceed the requirements. No repeat sampling is required after remediation.					
Notes:	N/A					
Data Delivery:	Reports from preflight microbial analysis of surface samples will be provided to the JSC Microbiology Laboratory personnel and the MMOP Microbiology Subgroup prior to vehicle launch.					

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3.5 In-Flight Activities

TABLE 3.5.1a: IN-FLIGHT ACTIVITIES – Surface Sampling

In-Flight Activity Description: Schedule:	Samples will be collected from the habitable surfaces within the ISS for in-flight and ground analysis.					
	Activity:	Duration:		Schedule:	Flexibility:	Personnel Required:
	Surface Sample Collection	Unstow:	15 minutes	Within 30 days of a returning Soyuz in each module (Lab, Nodes 1, 2, and 3, Columbus, JPM, PMM, Airlock).	N/A	1 Crewmember
		Sample:	10 minutes/site (2 slides/site)			
Stow:		10 minutes				
Procedures:	Procedures are contained within the System Operations Data File (SODF) Med Ops Book					
Constraints / Special Requirements:	<ul style="list-style-type: none">Whenever possible, microbiology sample collections should be coordinated with microbial air sampling. Samples will be stowed in a convenient location and incubated at ambient ISS temperature.Total time will depend upon number of modules to be sampled.(nominal sampling session is generally 155 minutes)					
Photo / TV Requirements:	In the event that an acceptability limit is exceeded, a request for contingency digital photography downlink of the sample shall be requested by ground-control. See In-flight Activity - Visual Analysis					
Cold Stowage Requirements:	N/A					
Mission Extension Requirements:	N/A					
Notes:	<ul style="list-style-type: none">Late access for hardware: L-2 weeksData and sample source should be recorded on surface sampler slide					
Data Delivery:	<ul style="list-style-type: none">N/A					

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TABLE 3.5.1b: IN-FLIGHT ACTIVITIES – Visual Analysis (colony count of surface and air samples)

In-Flight Activity Description:	Enumeration of surface samples is performed. Visual analysis is compared to a colony density chart. Record visual analysis (counts) of the surface samples.				
	Activity:	Duration:	Schedule:	Flexibility:	Personnel Required:
Schedule:	Data recording and Visual Analysis of surface samples	Unstow: 5 minutes Analysis: 2 minutes/slide (number of samples depends upon number of modules sampled) Stow: 10 minutes	At T.0+5 days post-sampling	T.0+5 days can be read between 5 & 6 days.	1 Crewmember
Procedures:	Procedures are located in the System Operations Data File (SODF) Med Ops Book				
Constraints / Special Requirements:	<ul style="list-style-type: none"> Nominal Sampling Session is 95 minutes (12 petri dishes and 26 slides total) Visual analysis of surface samples & data recording should be done after T.0 + 5 days of incubation. If surface samples are unable to be quantified or above the limits, digital imaging, repeat sampling and/or remediation may be required. 				
Photo/TV Requirements:	<ul style="list-style-type: none"> A request for contingency digital photography downlink of the sample may be requested by ground control if sample results are unable to be quantified. In the event that an acceptability limit is exceeded, contingency digital photography downlink of the sample may be requested by ground control. 				
Cold Stowage Requirements:	N/A				
Mission Extension Requirements:	N/A				
Notes:	<ul style="list-style-type: none"> When analysis for in-flight surface samples exceed the acceptability limits, remediation actions may be initiated. Follow-up samples may be taken and analyzed to ensure any remediation actions that were performed were successful. If the analysis of the in-flight surface sample indicates an elevation or trend, then JSC Microbiology Laboratory will notify the Anomaly Resolution Team (ART) and/or Common Environments Team (CET), which includes the ISS Increment Lead Crew Surgeon. 				
Data Delivery:	<ul style="list-style-type: none"> Any data called down during activities will be logged by BME and distributed to Crew Surgeon and to JSC Microbiology Personnel. Results are called down or recorded in crew notes of Optimis, called down to MCC-H, and/or XML downlink. Downlinked data will be made available to JSC Microbiology personnel upon receipt. A data summary from the in-flight analyses will be distributed to stakeholders within 1 week of receipt of downlinked data file. 				

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In-Flight Activities, (cont'd)

TABLE 3.5.2: IN-FLIGHT HARDWARE

Hardware/Software Name
Packet Assembly, Surface Sampler
Incubation Bag

3.6 Postflight Activities

TABLE 3.6: POSTFLIGHT ACTIVITIES

Postflight Activity:	Comprehensive microbial analysis will be performed by JSC Microbiology Laboratory on returned surface samples, identification of isolates will be performed.				
	Activity:	Duration:	Schedule:	Flexibility:	Personnel Required:
	Destow and Return of Surface Samples	Vehicle Dependent	Vehicle Dependent	N/A	JSC Personnel
	Postflight Hardware:		Postflight Software:	Test Location:	
	N/A		N/A	N/A	
	Minimum Room Dimensions:	Number of Electrical Outlets:	Temperature Requirements:	Special Lighting:	
	10' x 15'	4	Ambient	N/A	
	Hot or Cold Running Water:	Privacy Requirements:	Vibration/Acoustic Isolation:	Other:	
	Water for hand-washing	None	N/A	N/A	
Constraints/Special Requirements:	<ul style="list-style-type: none">Stowage temperatures during transport of the return samples to the Microbiology Laboratory should be maintained between 4°C - 54°C temperatures and shall be monitored during storage and transport.				
Early Destow/Early Destow:	Archive (return) samples are approved for early destow from IP, US, and COTS vehicles per OB-14-023.				
Notes:	Microbial isolates from in-flight surface samples will be identified by standard laboratory methods. Samples will be analyzed for identification of bacteria.				
Data Delivery:	<p>If the analysis of the returned surface samples indicates the recovery of the a potential pathogen that may pose risk to crew or environment, then JSC Microbiology laboratory will notify the Anomaly Resolution Team (ART) and/or Common Environments Team (CET), which includes the ISS Increment Lead Crew Surgeon.</p> <p>Results from the analysis of samples will be reported within 30 days of receipt.</p>				

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3.7 Summary Schedule

TABLE 3.7: SUMMARY SCHEDULE

ACTIVITY:	DURATION:	SCHEDULE:	PERSONNEL:	CONSTRAINTS:
Preflight Training:				
EHS Microbiology Operations	Inexperienced CM: 60 minutes Experienced CM: Crew retention of skills tested in EHS Assessment, which is 90 minutes total	Pre-Assignment Training Flow L-24/20	Crewmembers/ Instructor	None
Preflight:				
ISS Module Surface Sampling	Vehicle Dependent	Vehicle Dependent	Vehicle Dependent	Surface sampling will consist of 8-10 sites per flight element.
In-Flight:				
Surface Sampling Collection	Unstow: 15 minutes Sample : 10 minutes/site Stow: 10 minutes	Within 30 days of a returning Soyuz in each module (Lab, Nodes 1,2, and 3, Columbus, JPM, PMM, Airlock)	1 Crewmember	<ul style="list-style-type: none"> Surface slides will be incubated for a total of 5 days after sample collection. Total time will depend upon number of modules to be sampled. If possible, surface sampling should be performed on the same day as air and water sampling.
Visual Analysis (colony count of surface and air samples)	Unstow: 5 minutes Analysis: 2 minutes/Slide Stow: 10 minutes	At T.0+5 days post-sampling	1 Crewmember	Total time will depend upon number of samples to be analyzed.
Postflight: – No Crew Time				
Destow and Return of Surface Samples (no crew time)	Vehicle dependent	Vehicle dependent	JSC Personnel	<ul style="list-style-type: none"> Returned samples should be between 4°C - 54°C temperatures and shall be monitored during storage and transport. Early destow of surface samples and return to JSC has been approved
Postflight Debrief:				
Debrief	No extra time	~R+30 days	Crewmembers/ Microbiology Team	Included as part of the Med Ops overall debrief.